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THESIS

LOGISTICS BUSINESS PRACTICE CHANGES FOR THE MANAGED CARE ENVIRONMENT: INPATIENT CONSUMABLE SUPPLY COST CAPTURE BY PATIENT, PROVIDER, AND DRG

by

Stephen J. Piraino

December, 1994

Thesis Advisors: Paul J. Fields
James A. Scaramozzino

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The Department of Defense has implemented a new strategy called managed care to control costs, to improve access to care, and to optimize the size of the Military Health Services System. Capitation based resource allocation has significantly changed the incentives of hospital commanders, because they are now responsible for the cost of all care provided to beneficiaries within their catchment area. This includes care provided both in-house and care that was previously provided under CHAMPUS. Thus the previous practice of demand shifting will not alleviate potential budget problems.

This study recommends business practice changes that are required in order for Navy Medicine to compete in this new environment. The changes include pursuit of a product-line type accounting system, and an integrated Materials Management Information System capable of supply cost capture by patient, provider, and diagnosis.Current cost accounting and logistics practices only provide aggregate supply consumption data segregated by work-center. In order for the Department of Defense and the Services to provide quality care in the most cost effective manner, actual cost data must be captured by patient, provider, and diagnosis.

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by

Stephen J. Piraino
Lieutenant, Medical Service Corps, United States Navy
B.S., Stonehill College, 1983

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Author: _____
Stephen J. Piraino

Approved by: _____
Paul J. Fields, Thesis Co-Advisor

_____
James A. Scaramozzino, Thesis Co-Advisor

_____
David R. Whipple, Chairman
Department of Systems Management

ABSTRACT

The Department of Defense has implemented a new strategy called managed care to control costs, to improve access to care, and to optimize the size of the Military Health Services System. Capitation based resource allocation has significantly changed the incentives of hospital commanders, because they are now responsible for the cost of all care provided to beneficiaries within their catchment area. This includes care provided both in-house and care that was previously provided under CHAMPUS. Thus the previous practice of demand shifting will not alleviate potential budget problems.

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I. INTRODUCTION

A. GENERAL

The delivery of cost effective and efficient health care is one of the most widely debated issues of our times. This concern applies equally well to the military as it does to private health care systems. For Fiscal Year 1995 the Defense Health Program share of the $263.7 billion defense budget totals were $15.3 billion or 6%. From 1980 to 1990 annual private health care expenditures increased on average, 11.6% per year (Ref. Jencks, 1991). During this same time period, Department of Defense health care expenditures increased an average of over 20% annually (Ref. U. S. Department of the Navy). Efforts at controlling costs are needed in every aspect of health care. With approximately 43% of every health care dollar spent on consumable supplies, significant cost savings could be achieved by controlling consumable supplies.

There is concern at the U.S. Navy's Bureau of Medicine & Surgery over the lack of ability to identify and analyze consumable supply cost data by Diagnosis-Related Groups. This lack of actual cost data is perceived as critical when viewed within the requirements of a capitated budget process that was implemented by the Department of Defense for the first time in Fiscal Year 1995, and under the Department of Defense's current health care reform initiatives, particularly Managed Care.

Many private health care systems have invested massive amounts of capital for information management systems to capture actual costs down to the patient level. The thrust of this research effort is to reconcile the Department of Defense and Navy's current information management systems and logistics business practices to the requirements of Diagnosis-Related Groups cost management.

B. RATIONALE FOR AND EXPECTED BENEFITS OF THE STUDY

This study is expected to result in a greater understanding of the logistics business practice changes that are required in order for Navy Medicine to compete in the new Managed Care environment. Current cost accounting and logistics practices only provide aggregate supply consumption data segregated by work-center. In order for the Department of Defense and the Services to provide quality care in the most cost effective manner, actual cost data must be captured by patient, provider, and diagnosis.

Since physicians control, through their decisions, 70% of the total dollar expenditure within a facility, physician practice pattern programs can be an effective means of controlling supply costs (Ref. Shulkin, 1993). These programs strive to reduce variation in physician's practice patterns which can lead to lower treatment costs. These programs, however, utilize cost data that is not currently available in DoD and Navy financial systems.

C. INCENTIVES

Past approaches to contain cost growth within DoD, included initiatives such as budgetary limitations, utilization review, and restrictions on capital expenditures. Reducing patient demand for care was not a major strategy. Utilization of services within a military treatment facility was primarily controlled by limiting access. Excess, unsatisfied demand was shifted to CHAMPUS or outside the military health care system.

Under managed care and capitated budgeting, hospital commanders are responsible for providing a full spectrum of health services within their accountable network consisting of the military treatment facility, CHAMPUS, and managed care support contracts. Thus, demand shifting will not alleviate budget problems. Instead, hospital commanders should look for

the most cost effective source of providing care. Actual cost data by diagnosis is required for this type of decision making, and unfortunately, it is not available.

D. OBJECTIVES OF THE RESEARCH

The objective of this study centers on the need for Navy medical treatment facilities to capture actual consumable supply costs by Diagnosis-Related Groups. The literature is replete with research revealing that using actual cost data segregated by Diagnosis-Related Groups, and by health care provider, can control today's rising health care costs through the reduction of variation in physician practice patterns, to avoid unnecessary consumption of valuable resources. However, the Navy's current cost accounting systems, with input from its current logistics systems, can only provide average aggregate cost data. This average cost data is not sufficient input for cost effectiveness initiatives.

This study examines how civilian hospitals capture actual consumable supply costs and recommends logistics business practice/information management systems changes that Navy Medicine must make in order to begin capturing actual cost data to provide quality medical care in a capitated finance scheme, and to better control costs.

E. RESEARCH QUESTIONS

The questions examined are as follows:

1) How can Naval hospitals capture actual consumable supply costs by Diagnosis-Related Groups on inpatient units?

2) How can Naval hospitals capture actual consumable supply cost data from high workload ancillary services such as laboratory, radiology, and pharmacy?

3) What changes must Navy medical treatment facilities make to current logistics business practices/information management systems to capture actual cost data?

F. SCOPE OF THESIS

The scope of the research will focus on capturing actual consumable supply costs by Diagnosis-Related Groups for the inpatient setting only. Outpatient treatment area classification systems are structured in a different manner than those in inpatient areas. The author hopes that findings within the inpatient setting will be expanded to the outpatient setting through further study. Other costs of treatment such as labor costs, capital equipment depreciation costs, and allocation of overhead are not considered as these issues would add much more complexity to the research than could be completed by this study.

G. RESEARCH METHODOLOGY

The research methods include the gathering of information from the most current and relevant literature available, and through telephonic and personal interviews. Literature was obtained from the Naval Postgraduate School Library; the Stanford University Library; the Salinas Valley Memorial Hospital Library; the Defense Technical Information Center; the Defense Health Resources Study Center, Monterey, CA; the National Naval Medical Center, Bethesda, MD; the Naval Medical Information Management Center, Bethesda, MD; the Joint Medical Logistics Functional Development Center, Fort Detrick, Frederick, MD; and applicable Navy and Department of Defense regulations, directives, instructions, policy letters, and current periodical literature. Programs within the Navy and Department of Defense that are currently under development are examined by means of draft instructions, draft policy letters, and executive summaries/briefing books. Final versions of these draft documents that were not available at the time of this research are annotated as such in the References section of this thesis.

H. ORGANIZATION OF THE STUDY

Chapter II first provides a background examination of the current military health care environment to include health care reform initiatives currently being undertaken such as Managed Care. The study discusses capitated budgeting and its implementation by the Department of Defense and the Services. The study then describes Diagnosis-Related Groups, i.e., what they are, how they work, and how hospitals have historically tracked costs prior to their development and subsequent introduction.

Chapter III describes cost capture under the current logistics practices and information management systems being utilized at Navy medical treatment facilities for acquisition, storage and retrieval, and distribution of consumable supplies.

Chapter IV examines how civilian hospitals capture consumable supply costs by Diagnosis-Related Groups for inpatient units and then examines how actual costs are captured for ancillary services such as laboratory, radiology, and pharmacy.

Finally, Chapter V provides a summary, discusses the conclusions drawn from the findings, and makes recommendations based on these findings.

II. BACKGROUND

A. HEALTH CARE COSTS SPIRAL UPWARD

The cost of health care in the United States has risen from $42 billion in 1965 to $912 billion in 1993. Health care costs as a percentage of Gross Domestic Product have also risen from 5.9% to 14.6% during the same period. Health care costs are projected to continue to increase as a percentage of Gross Domestic Product through the year 2000 with total U.S. health care spending exceeding $1.631 trillion. (Ref. U. S. Congressional Budget Office, 1993)

From 1980 to 1990 annual private health care expenditures increased on average 11.6% (Ref. Jencks, 1991). During this same time period, annual Department of Defense health care expenditures increased an average of over 20% (Ref. U. S. Department of the Navy). For Fiscal Year 1995 the Defense Health Program budget totalled $15.3 billion or 6% of the $263.7 billion Defense Budget (Ref. U. S. Office of Management and Budget, 1994).

B. HEALTH CARE REFORM

We live in a time of increased emphasis on reducing the national budget deficit and controlling the costs of national health programs. Clearly, much of the initiative for health care reform both nationally under the President's National Health Care Reform Plan, and under the Department of Defense's health care reform, is due to these escalating health care costs. However, a variety of other factors are behind the Department of Defense's health care reform actions as well. These other factors include:

- Uneven access to care;
- Overcrowding in the military treatment facilities;
- Maldistribution of health care resources;

- Duplication of effort among the military medical services;
- Decreased Department of Defense funding levels;
- Strained military treatment facility capabilities due to downsizing of military end strength, and base realignment and closure actions, including military treatment facility closures; and
- Increasing shift of patient care workload to the civilian sector (Ref. Lamar, 1994).

C. MANAGED CARE

To accomplish its medical mission, the Department of Defense added three major components to its health care program in 1993, beginning the transition to managed care. These three components are:

1) The Lead Agent concept executed through Regional Health Services Plans;

2) Implementation of capitation based resource allocation methodologies; and

3) Implementation of fixed-price Managed Care Support contracts (Ref. Assistant Secretary of Defense for Health Affairs, 1993).

The Managed Care Program will significantly expand the use of managed care concepts and will emphasize accountability for health care spending (Ref. Lamar, 1994). To ensure optimum utilization of valuable resources, economic analysis will be conducted before the implementation of any regional Managed Care Support contracts. When care is not available at a military treatment facility, patients will be referred to providers delivering care under the Managed Care Support contract. The cost effectiveness of regional managed care programs is determined based on the combined cost of health care in the direct care system, i.e., within the military treatment facilities, and the cost of care that was out-

sourced to civilian alternatives under the Managed Care Support contracts (Ref. Assistant Secretary of Defense for Health Affairs, 1993).

1. Lead Agents & Health Services Regions

The Department of Defense has established 12 Health Services Regions within the United States, each with a designated Lead Agent, i.e., Military Treatment Facility Commander. Lead Agents working with all the Services regional military treatment facility commanders and their staffs are responsible for development of a Tri-Service Regional Health Services Plan for all beneficiaries, including the care provided through civilian alternatives. A single Managed Care Support contract, centrally procured by the Office of the Assistant Secretary of Defense (Health Affairs) for each region with input from the Lead Agent and Military Treatment Facilities will be responsible for development of a single integrated network of civilian providers to complement an augment direct care capabilities (Ref. Assistant Secretary of Defense for Health Affairs, 1994). Lead Agents will be fully involved in the development, procurement, transition, and operation of the Managed Care Support contract. The regional Lead Agents and supported populations are depicted in Figures 1 and 2. The major responsibilities of the Lead Agents are to:

- develop a Regional Health Services Plan and annual updates in coordination with regional Commanders;
- develop clinical support contingency plans in concert with regional medical facilities, reserve units, and the Managed Care Support contractor;
- ensure the regional health services delivery plan contains a Continuous Quality Improvement component;
- develop regional Managed Care Support Contract requirements within the framework of overall Department of Defense Policy;

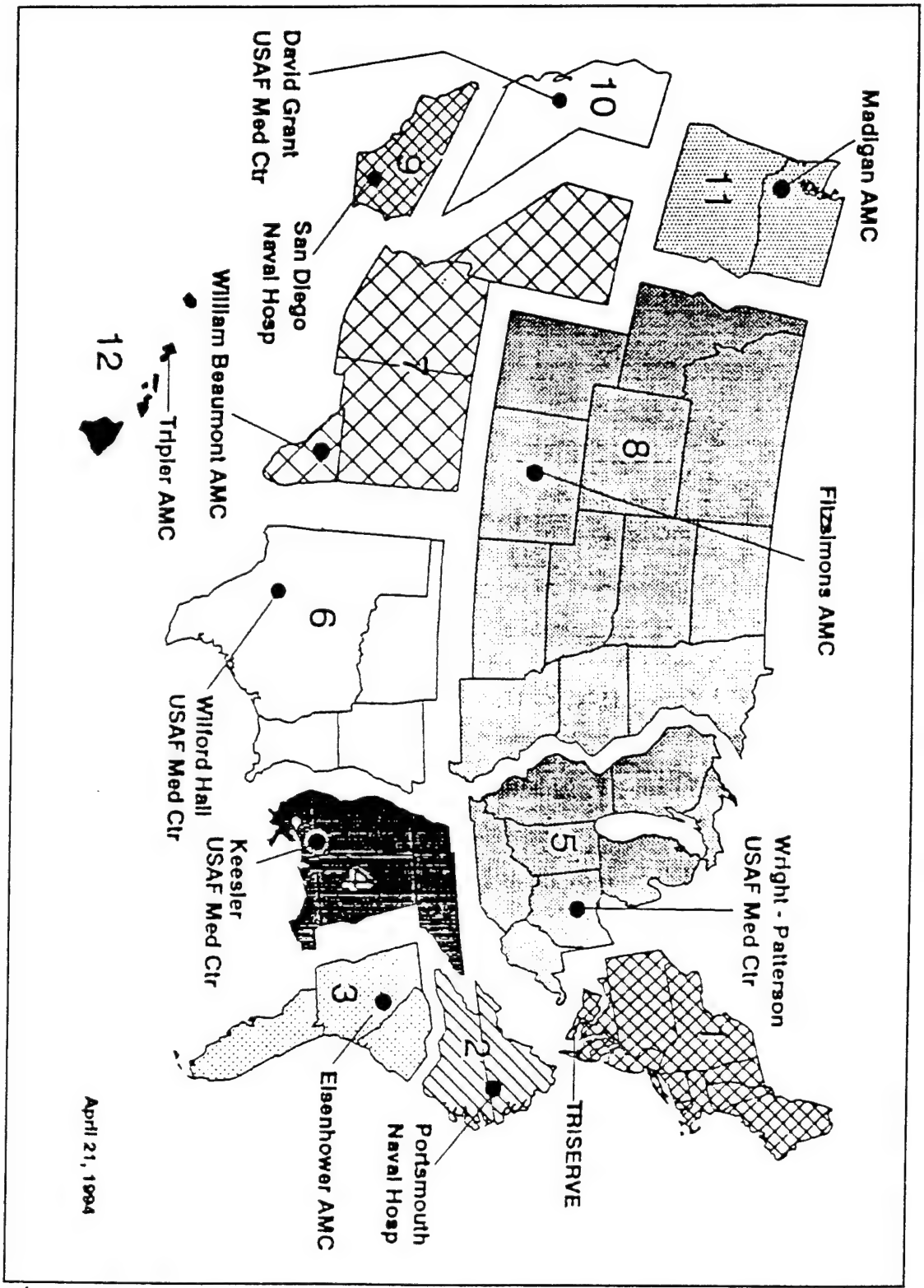

Figure 1. DoD Health Service Regions (Ref. From Lamar, 1994)

REGIONAL LEAD AGENTS, SUPPORTED POPULATIONS, AND FACILITIES

SERVICE REGION	LEAD AGENT (SERVICE)	POPULATION SUPPORTED	ARMY FACILITIES	NAVY FACILITIES	AIR FORCE FACILITIES	TOTAL FACILITIES
1	NATIONAL CAPITAL (TRISERVICE)	1,093,918	5	6	4	15
2	PORTSMOUTH (USN)	872,011	3	3	2	8
3	EISENHOWER (USA)	1,063,770	4	4	5	13
4	KEESLER (USAF)	595,024	3	2	5	10
5	WRIGHT PATTERSON (USAF)	653,328	2	1	3	6
6	WILFORD HALL (USAF)	949,776	4	1	9	14
7	WILLIAM BEAUMONT (USA)	323,056	2	0	5	7
8	FITZSIMONS (USA)	732,621	5	0	9	14
9	SAN DIEGO (USN)	710,461	1	3	3	7
10	DAVID GRANT (USAF)	382,590	1	2	4	7
11	MADIGAN (USA)	350,439	1	2	1	4
12	TRIPLER (USA)	151,750	1	0	0	1
	TOTALS	7,378,948	31	23	53	106

Figure 2. Lead Agents, Facilities, and Supported Populations (Ref. After Assistant Secretary of Defense for Health Affairs, 1993)

- develop procedures for coordinating health care delivery between military and civilian health care provider in the region;
- monitor CHAMPUS budget targets;
- coordinate utilization management and quality assurance activities;
- establish priorities for routing beneficiaries to the direct care system;
- determine the level and cost of resource sharing between military treatment facilities and the Managed care Support contractor throughout the region;
- develop regional policy for coordinating patient referrals and issue of non-availability statements in accordance with Department of Defense policy;
- designate and maintain the regional Specialized Treatment Services program for certain resource intensive clinical services within the region;
- coordinate the development of an annual regional capitalization, maintenance, repair and renovation plan for military treatment facilities within the region;
- oversee efforts to disseminate information about the Managed Care Program to beneficiaries and direct care and contractor staff;
- conduct ongoing evaluations and coordinate corrective actions relative to resource utilization, clinical services, and access as appropriate; and
- coordinate the development of a region-wide information systems modernization plan for all military treatment facilities within the region. (Ref. Assistant Secretary of Defense for Health Affairs, 1994)

2. Capitation-Based Resource Allocation

The concept of capitation is an important strategy for containing the cost of health care. Under a capitation system, the commander of each military treatment facility assumes responsibility for providing health services to a defined population, for a fixed amount per beneficiary.

Regardless of the amount of health services used, there is no financial incentive under a capitation methodology to inappropriately increase the number of services, or to provide more costly care than is clinically appropriate. Because a capitated allocation system makes the military treatment facility commander responsible for providing all health services, it encourages the commander to ensure that care is provided in the most cost effective setting, to utilize preventive services, to effectively deliver each episode of care and to carefully monitor the volume of provided services. Capitation discourages inappropriate hospital admissions, excessive lengths of stay, and unnecessary services. The health care provider cannot influence the funding received for beneficiaries care, because the capitation amount is set prospectively. Thus there are no financial incentives for workload inflation. (Ref. Assistant Secretary of Defense for Health Affairs, 1993)

Prior to Fiscal Year 1995 the military services traditionally programmed and budgeted for health programs based on historical resource consumption and workload trends. The limitation of this approach is a built in incentive to provide more services than are clinically necessary. This budgeting and allocation methodology provides significant disincentives for the use of limited resources. Typically, larger budgets are allocated to hospital commanders for generating more workload, without always being held accountable for the necessity of the workload generated. (Ref. Assistant Secretary of Defense for Health Affairs, 1993)

The modified capitation model developed by the Department of Defense and the Services, is a population-driven methodology. Its purpose is to allocate Defense Health Program resources to the three services. True capitation requires enrollment and more accurate resource data. Thus the

modified system is transitional as population/enrollment surveys are currently ongoing.

Resource allocations are based on a two step process that reflects each Service's unique requirements. The Department of Defense Office of Health Affairs first allocates CHAMPUS, direct care operations and maintenance, and military personnel resources to the three services using a financially-based capitation methodology. The Services then allocate resources to each of their medical treatment facilities based on a modified capitation methodology. In addition the three Services identify all CHAMPUS resources for the Lead Agent's management oversight at each of the 12 Health Service Regions. Further allocation of CHAMPUS resources is dependent on the service affiliation of the Lead Agent and the existence of a fixed-price Managed Care Support contract. (Ref. Assistant Secretary of Defense for Health Affairs, 1994)

3. Managed Care Support Contracts

The Department of Defense is transitioning from standard fee-for-service financing of care purchased from civilian providers under CHAMPUS to large Managed Care Support contracts for support of the 12 Health Service Regions. These contracts procured centrally by OCHAMPUS are designed to assist the Lead Agents and the military treatment facilities in their responsibility to improve access to quality care while controlling costs. The contracts are fixed-price, risk-sharing type contracts intended to provide substantial incentives for the contractor to develop innovative programs and linkages with the military treatment facilities. The primary functions of the contract include:

- Development of civilian provider networks,
- Claims processing and data collection,
- Utilization Management and Quality Assurance,

- Patient routing and referral,
- Provider and beneficiary education, and
- Marketing. (Ref. Assistant Secretary of Defense for Health Affairs, 1994)

The development, procurement, transition, and operation of the Managed Care Support contracts is a joint effort on the part of the military treatment facilities, Lead Agents, Services, and the Department of Defense. Lead Agents have the responsibility for the management of the health care requirements of the contracts. The contractor assists the Lead Agent in determining the optimal manner to supplement direct care capacity through civilian contracting or resource sharing and working with each involved military treatment facility. (Ref. Assistant Secretary of Defense for Health Affairs, 1994)

However, until the Department of Defense develops an improved capability to assess and estimate costs for ambulatory care, hospital care, and the other direct care delivered, it faces great difficulty in successfully implementing Managed Care. One method of assessing these costs, in the inpatient setting, is through the use of Diagnosis-Related Groups.

D. DIAGNOSIS-RELATED GROUPS

1. What are Diagnosis-Related Groups?

Diagnosis-Related Groups (DRGs) are a method of classifying inpatient episodes of care according to meaningfulness and resource use. DRGs utilize diagnoses, procedures, age, sex, comorbidities, and complications to classify patients into one of 475 categories. (Ref. Mckee, 1990)

DRGs were developed in the early 1970's by Fetter, Freeman, and Thompson at Yale University. This group

attempted to form groups of similar medical admission categories by means of diagnostic, demographic, and therapeutic characteristics. These groupings were originally created using the International Classification of Disease Codes, 8th revision, or ICDA-8 Codes, and were later updated using ICD-9-CM Codes. (Ref. Long, 1986)

New Jersey became the first state to adopt DRGs for prospective payment of medical claims in 1978 (Ref. Davies, 1983). The acceptance of DRGs grew out of the need for validation of claims by hospitals based on clinically relevant productivity measures (Ref. Munson, 1987). This approach by the state of New Jersey was evaluated by the Health Care Financing Administration. Subsequent to these evaluations, they were implemented in 1983 by the Health Care Financing Administration as a method of reimbursing hospitals for Medicare patients. Medicare followed by establishing new reimbursement parameters requiring all claims to be paid under a DRG review format in 1983. (Ref. Davies, 1983)

The Health Care Financing Administration's main goal in adopting DRGs was to contain the spiraling cost of the Medicare program by establishing a fixed prospective payment for each episode of care. For civilian hospitals the payment is based on the average cost experience within a DRG. In order to remain profitable, many hospitals discharge patients at or below the average length of stay or reimbursement cutoff point. (Ref. Mckee, 1990)

2. Use of Diagnosis-Related Groups

Public Law 100-80 requires the use of Diagnosis-Related Groups for the allocation of medical resources in Department of Defense medical treatment facilities (Ref. McKee, 1990). DRG use has become widespread within the United States for three primary reasons: Medicare, comparability between hospitals, and cost variance management within hospitals. When Medicare mandated payment by DRG for all patients in

1983, few hospitals had a choice but to adopt the DRG classification system (Ref. Burke, 1992). Rather than continue to lose revenue for Medicare covered admissions, hospitals adopted the system to be more fully compensated for work performed.

Each DRG has an assigned relative weight that corresponds to the average resource intensity of that DRG compared with all others. For example, DRG 373, normal vaginal delivery, has a weight of 0.32, which means that on the average it uses 32% of the resources when compared to a DRG with a weight of 1.0. On the other hand, DRG 387, premature delivery with major complications, has a weight of 1.70, making it 70% more resource intensive than the average DRG. When comparing across DRGs the weighted average is called the case mix index and can be interpreted as the average resource intensity of admitted cases. (Ref. Mckee, 1990)

Under the comparability issue, it became apparent very early on that the adoption of the DRG classification system by numerous hospitals provided a means for individual facilities to compare their effectiveness, by category, to other facilities. This ability fostered more cost consciousness by hospitals and began an era of strategic planning focussed on competition with other facilities. (Ref. Burke, 1992)

The final outgrowth of the adoption of inpatient DRGs has been a marked increase in the adoption of variance management programs, especially physician practice pattern programs. These programs provide cost data to physicians in order to foster cost consciousness, exert peer pressure between physicians practicing within the same clinical area to control costs, and to allow administrators to manage and trend inpatient costs by DRG and provider.

As discussed earlier, the Department of Defense has taken the first steps toward allocating resources to military treatment facilities by means of capitated budget techniques

based on DRGs. The Department of Defense has also adopted DRGs for use in its utilization review programs now being implemented in Navy medical treatment facilities (Ref. National Naval Medical Center, 1994). The adoption of DRGs has not only swept the United States, and now the Department of Defense, but has spread all over the world. By 1992, DRGs had been adopted in some form in twenty different countries (Ref. Burke, 1992).

It is these facts that drive the discussion in this study. DRGs seem to be the universal standard for evaluating episodes of care, and seem to be the most sound vehicle through which costs can be managed. Some civilian hospitals have already discovered that capturing consumable supply costs, as well as other costs, by DRG has benefits. These benefits appear to be large, especially when applied directly to variance management/reduction programs, such as physician practice pattern programs. However, in order for the Navy Medical Department to derive these benefits, it must begin to capture these consumable supply costs by Diagnosis-Related Groups.

III. NAVY TREATMENT FACILITIES

A. SUPPLY COST CAPTURE

Hospital administrators and material managers typically have little knowledge of where, how, when, or on whom consumable supplies released into the direct patient care system are used. This has left management personnel with nothing more than aggregate supply expense information, gathered at periodic intervals, on which to base decisions. This lack of knowledge of consumable supplies usage is due primarily to the prevalent use of cost-center accounting techniques. (Ref. Johnson, 1992)

1. Cost-Center Accounting

Cost-center accounting is practiced at Navy medical treatment facilities through the use of the Medical Expense and Performance Reporting System for Fixed Military Medical and Dental Treatment Facilities, hereafter referred to as MEPRS. The MEPRS system was implemented and has been in use since the fall of 1978. Having knowledge of the MEPRS structure and common generic elements facilitates understanding the flow and capture of expenses in Navy medical treatment facilities. MEPRS contains a hierarchy of accounts wherein all expenses and corresponding workload are grouped into six functional categories:

1) Inpatient Care,

2) Ambulatory Care,

3) Dental Care,

4) Ancillary Services,

5) Support Services, and

6) Special Programs. (Ref. U. S. Department of Defense, 1991)

Inpatient Care is defined as health care which provides for the examination, diagnosis, treatment, and proper disposition of inpatients. This functional category is a summarizing account that accumulates all inpatient operating expenses. It represents the total cost of inpatient care delivered in the facility (Ref. U. S. Department of Defense, 1991).

Ambulatory Care provides for the care, consultation, examination, diagnosis, treatment and disposition of both inpatients and outpatients treated by the various ambulatory care clinics, i.e., Orthopedics, Internal Medicine, Pediatrics, etc. (Ref. U. S. Department of Defense, 1991)

The Dental Care functional category includes all the operating expenses incurred in operating a dental center or dental clinic. (Ref. U. S. Department of Defense, 1991)

The Ancillary Services functional account accrues expenses for those services that participate in the care of patients by assisting and augmenting the health care providers in treating human ailments, i.e., Laboratory and Radiology. Support Services are those services that are necessary to direct and support the mission of the treatment facility, such as the Supply department, and Manpower Department. The Ancillary Services and Support Services accounts are intermediate operating expense accounts whose expenses are reassigned to one of the final operating expense accounts, i.e., Inpatient Care, Ambulatory Care, Dental Care, and Special Programs. (Ref. U. S. Department of Defense, 1991)

Special Programs includes those expenses for activities performed to support the facility's military mission rather than direct patient care, i.e., Contingency Planning and Operational Readiness type departments. (Ref. U. S. Department of Defense, 1991)

Functional Categories represent the broadest category for aggregating costs and they appear highest on the accounting

hierarchy. Each of the functional categories is further divided into summary accounts and sub-accounts. An example of the hierarchical arrangement would be:

Level I: Functional Category: Inpatient Care

Level II: Summary Account: Medical Care

Level III: Sub-account: Pediatrics (Ref. U. S. Department of Defense, 1991)

The final level typically corresponds to a work-center, i.e., Pediatrics ward. The practice of cost accounting involves the recording of expenses, such as for consumable medical supplies, at the point of transfer to a particular work-center. The work-center as a whole is viewed as the cost-center and is the last point of capture of cost data. This provides management personnel with little more than an aggregate measure of supplies used by the work-center, and no accurate way to tie those supply costs to each individual patient, episode of care, or procedure.

It is this cost accounting system, implemented decades before the current environment of managed care, that the logistics business practices and automated information systems were developed to support. Thus the logistics systems currently in place in navy treatment facilities only provide aggregate financial cost data.

2. Logistics Business Practices

Current logistics business practices result in clinical personnel spending valuable time and money inventorying, ordering, receiving, and stocking medical supplies in their areas. As a result, clinical personnel in Navy treatment facilities have established and maintain unofficial inventories to ensure availability of required medical material. Maintaining these unofficial inventories consumes supply dollars and degrades the ability of materials management personnel to forecast future needs and to justify related budgets. A description of the complexities of the

logistics system utilized by Naval treatment facilities is necessary in order to understand the difficulty in reforming logistics business practices to enable future capture of supply costs by Diagnosis-Related Groups.

a. Sources of Supply

When faced with a requirement to acquire an item needed for patient care, clinical personnel have no single, reliable reference available for researching the products that may be available, determining the apropriate source of supply, comparing product characteristics, and determining the best pricing. Compounding the problem are the multiple sources from where the item may be acquired, and the requirements and methods for acquisition from each source. Current sources of supply, in order of precedence per DoD, Navy, and local regulations, for most naval medical treatment facilities may include the following:

- Central Supply,
- Local Stock-Fund Warehouse,
- Defense Depot System,
- Prime Vendor, and
- Commercial Sources.

Paper catalogs of all items stocked in Central Supply and in Local Stock-Fund warehouses usually are made available to all departments within the facility by the Materials Management Department. These catalogs may be sorted numerically by stock number or alphabetically by generic product description. However, up-to-date versions are scarce at most facilities since printing and duplication are extremely time consuming and expensive. The short, generic product descriptions typically are not user-friendly as clinical personnel frequently use different descriptions of

products than listed in the catalogs. For example, clinical personnel looking for "chux" would find it listed in the typical catalog as "Pad, Bed Protecting." In addition, pricing determination is difficult since the total quantity in many instances is not listed, and only a unit of issue code is available, e.g., "CS" for Case. In order to perform accurate pricing comparison, price per unit of measure quantities must be known. If any additional product, or pricing information is required, then the clinical personnel must call the appropriate inventory management personnel in the Materials Management Department.

Hard-copy catalogs do not exist for the tens of thousands of medical items in the Defense Depot System. However, catalogs are available in CD-ROM format in most Materials Management Departments in Navy medical treatment facilities. Clinical personnel conducting research must leave their work-center to utilize the electronic catalog. Queries may be made by generic product description, and stock number, as well as by manufacturer, or manufacturer part number. Again, problems with the generic product descriptions still exist. However, once an item is found, complete product descriptions, quantity/unit packaging information, and pricing information are usually available.

Product catalogs from Prime Vendor contractors may be printed using the terminals provided by the Prime Vendor. However, these catalogs would have all of the problems discussed above, and would be extremely time consuming and expensive to provide for the entire medical treatment facility. Clinical personnel again would be required to leave their work-center to conduct their research on the terminals located in the Materials Management Department. Once an item is found, complete product descriptions, quantity/unit packaging information, and pricing information are usually available.

Product catalogs for items available from commercial manufacturers are typically found throughout the medical treatment facility. Manufacturers representatives often make sales pitches to clinical personnel and ensure that their catalogs are widely available. Some Materials Management Departments maintain extensive libraries of commercial catalogs for use by clinical personnel. However, comparison is often difficult since competing manufacturers products may not be known and their catalogs may not be available, or up-to-date. Thus, most clinical personnel contact manufacturers directly via telephone to obtain product information, availability, and pricing.

b. Ordering Procedures

Once the source of supply has been determined by the clinical personnel, the item must be ordered in accordance with local procedures in compliance with Federal Acquisition Regulations.

Ordering items from either Central Supply or from the Local Stock-Fund warehouse is usually accomplished by completion of a locally developed requisition form. The form typically requires entry of the department's name and location, and its cost-code for accounting purposes. The items desired are identified by stock number, generic product description, and quantity requested. In addition the requisition must include the unit cost, and extended cost for each item, and the total price for the entire order. Once the requisition is received by the Materials Management Department, it is <u>manually</u> entered into the appropriate logistics automated information system. Typically, the Central Processing & Distribution (CPD) system is used for Central Supply orders, and the Medical Inventory Control System (MICS) is used for local Stock-Fund orders. For cost accounting purposes the customer department is "charged" for

the order upon issue of the supplies from Materials Management. This is the final point of cost data capture.

Ordering items from the Defense Depot System is accomplished by completing a DD Form 1348. One form must be used for each item ordered. The customer must enter the National Stock Number, unit of issue, and quantity requested, as well as data identifying the facility, departmental cost-code, unit cost and total cost, and the required delivery date. Once the requisition is received by the Materials Management Department, it is manually entered into MICS for transmission to the Defense Depot System. For cost-accounting purposes the customer's department is "charged" for the item ordered when the order is transmitted. However the order may not actually be received by the department until 20 to 30 days later depending on stock availability and mode of transportation. Again, this is the final point of cost data capture. Receipt confirmation is manually entered into MICS by Materials Management personnel in order to complete the transaction.

Ordering items from the Prime Vendor is typically accomplished by completing a locally developed order form. The form typically requires entry of the department's name and location, and its cost-code for accounting purposes. The items desired are identified by the Prime Vendor's stock number, product description, and quantity requested. In addition the requisition must include the unit cost, and extended cost for each item, and the total price for the entire order. Once the order form is received by the Materials Management Department, it is manually entered into the Prime Vendor's automated information system. For cost-accounting purposes the customer's department is "charged" for the item ordered when the order is transmitted to the Prime Vendor and a confirmation is received. Once again, this is the final point of cost data capture. The material ordered is

usually received by the customer within 24 to 48 hours. Receipts are processed by exception and are manually entered into the Prime Vendor's automated information system by Materials Management personnel in order to complete the transaction.

Ordering from commercial sources is the most time consuming and complex when compared to ordering from the sources of supply previously discussed. Procurement from commercial sources is highly regulated by the Federal Acquisition Regulations (FAR), the Defense Federal Acquisition Regulations (DFAR), and the Navy Acquisition Procedures Supplement (NAPS). Customers are generally required to complete a NAVCOMPT Form NC 2276, Request for Contractual Procurement. The form must include the typical customer identification data, and also a complete line of accounting data including the customer's cost-code. The request may include several items to be ordered from a single commercial source. Each item must be described in **generic terms** in order to promote competition in the acquisition process. Due to acquisition regulations the customer is usually required to provide a minimum of two different manufacturers from where the items may be procured. Further, in order to comply with the acquisition regulations the customer is usually required to provide commercial sources that are Small Businesses, or commercial sources that have current Federal Supply Schedule (FSS), General Services Administration (GSA), or Veteran's Affairs (VA) contracts in effect. Finally, the customer is typically required to certify that the items are not available from any of the previously discussed sources of supply.

Once the Request for Contractual Procurement is submitted to Materials Management, it is thoroughly checked for completeness and accuracy. Each line item requested is screened for availability from each of the other 'higher precedence' mandatory sources. This is done by cross-

referencing the generic descriptions, or manufacturers' part numbers for National Stock Numbers, then manually checking for availability from Central Supply, and Local Stock-Fund warehouses, and from the Defense Depot System. If an item is found to be available from any of these sources, it will be canceled from the order, and the customer will be notified to re-order from the appropriate source. Once the required screening has been accomplished, the request form will be passed to an authorized Contracting Officer for procurement.

The process of procurement entails soliciting bids from several competing vendors for pricing for comparable products. This is usually accomplished telephonically, although quotes for larger orders may be solicited in writing by mail or by facsimile transmission. Once pricing has been obtained, the Contracting Officer generally awards the contract to the vendor with the lowest pricing, that can meet the customers required delivery date. Preference must be given to vendors who have GSA/VA schedules, and to vendors designated as small businesses. The contracting officer must then complete the purchase action by completion of a DD Form 1155 Purchase Order for Goods and Services. This is accomplished without the use of an automated information system at all but the Naval Medical Centers at Bethesda MD, Portsmouth VA, San Diego CA, and Oakland CA, which utilize the Automated Procurement System (APS). Some Naval hospitals are utilizing 'home grown' data-base type systems to print and store purchase order information. The purchase order is then mailed to the vendor, unless expedited action is necessary due to urgent customer requirements, where the order may be confirmed verbally or sent via facsimile transmission. For cost-accounting purposes the customer department is "charged" for the item ordered when the purchase order is **signed** by the contracting officer. However the order may not actually be received by the department for two to three weeks, depending

on the vendors stock availability, and mode of transportation. Again, this is the final point of cost data capture. Receipt confirmation is completed manually on a hard copy of the purchase order document by materials management loading dock personnel in order to complete the transaction. At the four APS sites, receipt confirmation may be completed on-line by manual data entry.

3. Logistics Automated Information Systems Overview

a. Central Processing and Distribution System

Currently 22 naval treatment facilities are utilizing a DoD standard system called the Central Processing and Distribution System (CPD). This system is primarily utilized for inventory management, and distribution of assets in the facility's Central Supply areas. The material stored in these areas is Operations & Maintenance (O&M) funded, pre-expended, facility owned. A typical Central Supply located at a Naval hospital may stock from 500 to 1000 line items. These items may come from all of the different sources of supply, but primarily from the local Stock-Fund warehouse which acts as an intermediate level of supply.

One of the key capabilities of the CPD system is the ability to "break-bulk". Material can be stored and issued in "unit of measure" quantities rather than "unit of issue" quantities. Unit of Measure quantities are generally single items, i.e., a bag of intravenous fluid. A Unit of Issue is generally a box, case, or package, i.e., a case containing six bags of intravenous fluid. Savings can be realized due to the customer's ability to obtain quantities that can be utilized within a short amount of time. Thus, waste due to excess order quantities and shelf-life expirations can be minimized.

Most of the facilities using the CPD system are currently providing 'push' inventory management services to

the inpatient areas. These services are either provided through exchange carts or through Periodic Automatic Replenishment (PAR).

Exchange cart services typically provide the inpatient unit customers with high-use consumable medical supplies, i.e., intravenous fluids and tubing, bandages, etc., on a daily basis. An inpatient unit may be provided with several exchange carts totalling several hundred different items. The process is considered to be automated in that the customer is not required to complete any orders for the material. Materials Management personnel physically exchange a cart of supplies that has been used, typically for 24 hours, with a **replenished** cart that had been used the previous day, called a "brother-cart". Each day materials management personnel inventory each item on each used cart with a hand-held bar-code scanner. The inventory is then down-loaded into the CPD system which calculates the required replenishment amount for each item based on historical demand data. A replenishment pick-list is then generated by the system for re-stocking of the cart. Once the pick-list is generated, the Central Supply inventory is automatically updated by the replenishment quantities, and the customer is "charged" in the CPD system. However, since the CPD system does not interface with any financial management system, and since the material has already been procured and charged to the Central Supply budget, i.e., pre-expended, the customer has not actually been charged. Some, but not all facilities perform aggregate cost transfers from Central Supply to the individuals on a periodic basis for cost accounting purposes.

PAR is similar to exchange carts services in that the customer's supplies are automatically replenished by materials management personnel, however, supplies are stored on shelves in the customer area rather that on movable carts. Materials Management personnel inventory and replenish all

items in the customer's area rather than in Central Supply. Thus, investment is less since no carts are required, and inventory is not duplicated on each set of brother carts.

Because the material is O&M funded, inventory management procedures and stock levels are determined locally by materials management and financial management personnel. The level of supply typically totals less than two weeks since material normally is replenished locally from the hospital's stock-fund warehouse. Inventory management is extremely flexible and levels can be set in numbers of days of supply for each individual item, or globally by source of supply. CPD automatically calculates inventory levels monthly based on actual demand over the previous 12 months, with the last month's demand weighted 75% and the previous eleven months' demand weighted 25%. Thus, if demand for an item changes significantly, shows seasonality, or trends sharply, the inventory levels should adjust appropriately. Inventory managers, however, may manually set the levels for each line item.

CPD is also capable of managing non-stocked items for each customer, if individual sub-storerooms are set-up. In addition CPD has the ability to manage case carts for the Operating Room. This functionality allows users to set-up a case cart which identifies all the items required for specific surgical procedure to be performed. These could be further defined by individual provider. The operating room personnel can then simply request a specific case cart, and materials management personnel would fill all the line items required from the Central Supply storeroom. However, no Naval treatment facilities are known to be currently employing these functionalities.

b. Medical Inventory Control System

Currently 18 Naval treatment facilities utilize a Navy standard automated information system called the Medical Inventory Control System (MICS). MICS is primarily used to order, receive, issue and manage Navy Stock-Fund material warehoused at Naval treatment facilities. The number of line items stocked by a typical Naval hospital in its stock-fund warehouses may be between 1000 and 2000 items. These items may come from the Defense Depot System, or commercial sources, including Prime Vendor. The mix of items is generally about 50% from the Defense Depot System and 50% from commercial sources. MICS is also used as a platform to order non-stocked Defense Depot System items for customers using O&M funding.

Because the locally stocked material is financed through the Navy Stock Fund, inventory management procedures and stock levels are strictly regulated by the Fleet Material Support Office (FMSO), Mechanicsburg, PA, the Navy Stock Fund manager. The levels of supply directed by FMSO are set as follows: one month of Order & Ship Time, one month of Safety Stock, and three months of Operating Stock, resulting in an average inventory level of two and one-half months of stock. This high inventory level contributes to waste through excess stock, obsolescence, and shelf-life expiration. MICS automatically calculates inventory levels quarterly based on an average of actual demand over the previous 12 months. If demand for an item changes significantly, shows seasonality, or trends sharply, the inventory levels may lag, thus leading to either over or under-stocking. Inventory managers, however, may manually set the levels for each line item.

FMSO also directs that material be stocked and issued in unit of issue quantities only. Customers must order entire cases or packages of an item, even when only single items may be desired. This leads to the possible waste of

valuable hospital resources as medical supplies are often stockpiled, fail to get rotated, and require disposal due to expiration of shelf-life.

MICS is not bar-code capable, and is thus very labor intensive. All customer orders must be manually keyed into the system, as well as all receipts for stock replenishment. In addition MICS does not interface directly with any other logistics automated system. Orders for replenishment of Central Supply, for example, must be manually keyed into MICS from a CPD printout. Once physically received at Central Supply, the orders must by manually keyed into the CPD system to update its inventory records. Finally, MICS only captures costs by individual work-center. This data may be loaded on magnetic tape for update of financial management's cost-accounting system. Figure 3 summarizes the capabilities of MICS and CPD.

c. Prime Vendor

The Prime Vendor Program is the Department of Defense's move towards commercial business practices and Just-In-Time inventory management. Eighteen regional Prime Vendor contracts have been awarded by the Defense Personnel Support Center (DPSC), Philadelphia, PA, as of 18 August 1994. Of these contracts, fourteen have been awarded for pharmaceutical products and four have been awarded for consumable medical/surgical supplies. (Ref. Walters, 1994)

Three different companies have been awarded regional contracts for medical/surgical supplies. These companies include Owens & Minor Inc. for the National Capital Region which includes the following Navy Treatment Facilities:

- National Naval Medical Center, Bethesda, MD,
- Naval Hospital, Patuxent River, MD,

- Naval Medical Clinic, Annapolis, MD, and
- Naval Medical Clinic, Quantico, VA. (Ref. Walters, 1994)

The San Diego Region serviced by Baxter Inc. which includes the following Naval Treatment Facilities:

- Naval Medical Center, San Diego, CA,
- Naval Hospital, Camp Pendleton, CA,
- Naval Hospital, Twentynine Palms, CA,
- Naval Medical Clinic, Long Beach, CA, and
- Naval Medical Clinic, Port Hueneme, CA. (Ref. Walters, 1994)

The Philadelphia Region awarded to General Medical Inc. includes the Naval Medical Clinic, Philadelphia, PA. (Ref. Walters, 1994)

Five different companies have been awarded regional contracts for pharmaceuticals. These companies include McKesson Inc. for the National Capital Region, San Diego Region, San Francisco Region, and the Cascades Region. (Ref. Walters, 1994)

The San Francisco Region includes the following Navy Treatment Facilities:

- Naval Medical Center, Oakland, CA,
- Naval Hospital, Lemoore, CA, and
- Naval Medical Clinic, Fallon, NV. (Ref. Walters, 1994)

The Cascades Region includes:

- Naval Medical Center, Seattle, WA,
- Naval Hospital, Bremerton, WA, and
- Naval Hospital, Oak Harbor, WA. (Ref. Walters, 1994)

Capability	CPD	MICS
interface for orders from customer areas	X	O
establish visibility of customer inventories	-	O
capture customer area demand history	-	X
interface with Prime Vendor systems	O	O
generate barcode labels for customer area locations	X	O
inventory customer areas using hand-held bar code scanners	X	O
identify items to be stocked in customer areas	X	O
establish stockage levels in customer areas	X	O
establish inventory schedules	X	O
utilize flexible inventory methods	-	O
build orders for multiple sources of supply	X	O
transfer items from customer area	X	-
return items from customer area	X	-
process receipts on exception basis	-	O
generate Ad-Hoc reports	-	O
track frustrated shipments	O	O
generate bar code labels for storeroom locations	X	O
link order process to receiving process	X	O

X = CAPABILITY IS SUFFICIENTLY PROVIDED
- = CAPABILITY IS INSUFFICIENTLY PROVIDED
O = CAPABILITY IS NOT PROVIDED

Figure 3. CPD and MICS Logistics Automated Information Systems capabilities (Ref. After Joint Medical Logistics Functional Development center, 1994)

Bergen-Brunswig Inc. was awarded the contracts for six different regions including: the Philadelphia Region which includes Naval Medical Clinic, Philadelphia; the Tidewater Region which includes Naval Medical Center, Portsmouth, VA; the Lone Star Region which includes Naval Hospital Corpus Christi, TX; and the Panhandle Region which includes Naval Medical Clinic, New Orleans, LA, and Naval Hospital Pensacola, FL. (Ref. Walters, 1994)

Tennessee Wholesale Inc. was awarded the Florida/Georgia Region which includes Naval Hospital, Orlando, FL, and the Naval Medical Clinics at Key West, FL, and Kings Bay, GA. (Ref. Walters, 1994)

Foxmeyer Inc. was awarded the Mid-West region and the Alabama/Tennessee/Arkansas Region which includes the Naval Hospital, Millington, TN. (Ref. Walters, 1994)

Kendall Inc. was awarded the Carolinas Region which includes the following:

- Naval Hospital, Beaufort, SC,
- Naval Hospital, Camp Lejeune, NC,
- Naval Hospital, Charleston, SC, and
- Naval Hospital, Cherry Point, NC. (Ref. Walters, 1994)

In addition there are six additional regional contracts yet to be awarded under the pharmaceutical Prime Vendor Program and seventeen additional regions yet to be awarded under the medical/surgical Prime Vendor Program.

Because the Prime Vendor contracts specify that the contractor will provide its commercial order entry software/system, there is currently a proliferation of eight <u>different</u> automated order-entry systems in use in Naval treatment facilities. Additionally, there is the possibility of twenty-three additional systems as the remaining regional Prime Vendor contracts are awarded.

None of the Prime Vendor order-entry systems are interfaced with any of the other logistics automated systems, e.g., MICS, or CPD. All information must be manually input for usage or demand history data. No Naval treatment facilities are known to be inputing this historical data, thus the information is not currently available. In addition all information must also be re-keyed for payment and cost-accounting purposes.

d. Automated Procurement System

The Automated Procurement System (APS) is the Navy's acronym for an automated contracting system used to automate the buying process for purchasing agents and provide for increased requisition status and management support with enhanced reporting capabilities. The system is a modified version of the Standard Automated Contracting System - Federal or (SACONS-FEDERAL) which was developed by Caci, Inc. This system is currently in place only at the Navy's four largest medical treatment facilities. Further expansion to other sites is not anticipated. Specific advantages of SACONS-FEDERAL, as promoted by Caci in company literature include:

- Improved productivity,
- Simplification of the work process,
- Enhanced status reports,
- Various standard reports and ad-hoc report capabilities,
- Reduced Procurement Administrative Lead Time,
- Automated document preparation,
- Electronic buyer worksheets, and
- Consolidation of purchase requests.

Additional enhancements were developed and procured in order to try to integrate the receiving process and the accounts payable and contract administration processes.

Like the other logistics automated information systems, SACONS-FEDERAL does not interface with any of the other logistics or financial management/cost-accounting systems. All data must be manually re-keyed into these other systems. For example, an item procured and received on the SACONS-FEDERAL system as stock replenishment for either Central Supply or Local Stock-Fund must be manually received in the CPD and MICS systems. This is time consuming and highly labor intensive.

B. SUMMARY

In Navy medical treatment facilities today most customer areas are not automated. A small number are supported by CPD terminals, are bar-coded, and can electronically replenish. Most, however, are supported by paper catalogs and paper order sheets. Nearly all customer inventory, research, ordering, receipt, and other processes are manpower intensive, paper-supported tasks which foster inefficiency and take clinical personnel away from their primary roles. In general, the inventories in customer areas are not visible as stock assets in the facility, and usage data is not captured in any logistics automated information system. All cost data requires manual entry for payment and cost-accounting purposes. As the Prime Vendor program expands, so expands the number of additional non-standard automated information systems. This makes the Navy logistics environment considerably more complex as no interface is used to tie Prime Vendor systems to any current logistics or financial management information systems.

Hospital administrators and material managers do not have knowledge of where, how, when, or on whom consumable supplies

released into the direct patient care system are used. This has left management personnel with nothing more than aggregate supply expense information, gathered at periodic intervals, on which to base decisions.

IV. CIVILIAN HOSPITALS

A. COST ACCOUNTING

Despite the widespread reimbursement by Diagnosis-Related Groups for much of the delivery of civilian health care, most facilities have only begun to analyze resource consumption by DRG. Cost-center or responsibility-center accounting systems have been the prevailing method health care facilities have utilized to monitor and control expenses. Like military treatment facilities, civilian institutions typically structure financial data by department, with individual department managers being held responsible for the expense performance within their functional responsibility center. These expenses usually include direct labor expense, supply expense, purchased services, and other expenses, which in some cases include allocated overhead expense. In this type of cost accounting system, top management generally focusses on financial performance by department and evaluates each responsibility center by its contribution to the health care facility's overall financial performance (Ref. Carroll, 1992).

In contrast to responsibility accounting, **product line** cost accounting involves organizing financial data by product or DRG, i.e., normal delivery, cholecystectomy, total hip replacement, coronary bypass, etc. However, because most hospitals are organized by function, i.e., Laboratory, Radiology, Internal Medicine, etc., financial responsibility is difficult to assign, since product lines or DRG's usually involve expenses from many different functional areas/departments. Cost accounting by product line provides administrators with the opportunity to intervene where profitability is marginal and monitor profit margins on more successful product lines. Product line accounting is useful in the health care environment due to its value in monitoring and controlling costs (Ref. Carroll, 1992).

B. SUPPLY COST CAPTURE

For civilian hospitals currently practicing product line accounting to monitor and analyze expenses by Diagnosis-Related Group, all costs from all functional areas must be captured for each individual patient, rather than for each department. The key to capturing consumable supply costs efficiently is an automated materials management information system, and a fully integrated hospital information system. The materials management information system must fully integrate the primary functional areas of materials management including:

1) procurement,

2) material receipt,

3) distribution, and

4) inventory management.

1. Materials Management Master Data Base

The heart of all materials management automated information systems is a master data base of all items purchased/utilized by the facility. This master data base must include all items stored in materials management controlled areas such as the main warehouse, and central supply room, as well as all items procured solely for direct use in individual patient care areas.

Each item in the master data base typically includes the hospital's identification number/stock number, item description, manufacturer, manufacturer's stock number/part number, unit of purchase from the manufacturer/distributor, unit of measure/use, unit of purchase price, and unit of use price. In addition a master vendor data base typically provides information on each manufacturer/distributor including identifying data such as address, names of key

points-of-contact such as sales representatives, and customer service representatives, and their respective phone numbers.

2. Logistics Business Practices

a. Customer Ordering Procedures

Generally, logistics business practices in civilian hospitals focus on "pushing" a very high percentage of material to the customer through the use of PAR level inventory management practices. In dollar volume terms the percentage of material typically pushed to patient care areas exceeds 90%. This virtually eliminates clinical personnel spending valuable time and money inventorying, ordering, receiving, and stocking medical supplies in their areas.

When faced with a requirement to acquire an item not available in PAR level stock, clinical personnel generally have one reliable source, the materials management master data base, for researching the products that may be available. Typical systems have query/search capability that allows the user to search by generic description, vendor, manufacturer part number, etc. Once an appropriate item is found the system will provide all the required information to obtain the item, including pricing information and the source of supply, e.g., hospital main warehouse, central supply, or direct from a commercial vendor.

If the item is stored in-house, the item may be ordered by calling materials management for immediate delivery to the patient care unit, or a standard order form may be completed.

If the item will be used frequently the patient care unit may request materials management to add the item to their PAR level. If the item is not stocked by materials management, clinical personnel simply complete the same standard order form which can be used regardless of the source of supply and which identifies the item and the quantity desired. If an appropriate item cannot be found in the

materials management master data base, clinical personnel again complete the same standard order form and provide as much item identifying data as known. Materials management personnel then research commercial sources for appropriate products to meet the customer's needs. Once an acceptable product has been found, the item is added to the master data base and an order is placed. Materials management will determine if the item warrants stockage in-house, based on expected future demand for the item.

b. Cost Capture by DRG

(1) Inpatient Units. Civilian hospitals typically use a cost capture system which entails the use of "charge stickers". In general all items which have a unit of use value in excess of one dollar are considered to be patient chargeable items. Some high volume items are exceptions to this rule, intravenous fluids typically cost less than one dollar per bag, yet are universally chargeable items. Each patient chargeable item has a bar code sticker physically attached to it by materials management personnel upon receipt at the hospital. The bar code on the sticker contains identification data, which when scanned identifies the item in the materials management information system. Whenever one of these items is used on a patient, the sticker is removed from the item and affixed to a patient charge sheet that is part of each patient record. The patient charge sheet is collected every 24 hours by materials management personnel, and scanned into the materials management information system. The actual item cost is then allocated to the patient for product line accounting purposes. Inventory levels for each PAR level on each unit is then recalculated by the materials management information system for replenishment purposes.

It should be noted that this allocation of costs is generally not used for billing purposes. In many hospitals the materials management information system is not

interfaced with the hospital billing system, thus the patient charge sheets must then be routed to finance for input for billing purposes.

The billed amount is typically derived through mark-up formulas, based on the actual cost of the item, the current market rate, or rate allowed by third party payors. One Central California hospital uses a mark-up scheme that bills items with actual costs in the one to ten dollar range at 4.21 times the actual cost. Items with actual costs in higher dollar ranges are billed at successively smaller mark-ups. An item that is typically billed at market rates is intravenous fluids. A bag of intravenous fluid which typically costs less than one dollar is charged between 25 and 30 dollars in the Monterey, California area, and between 90 and 100 dollars in the San Francisco, California area. (Ref. Church, 1994)

(2) Ancillary Services. Typically high volume workload ancillary services such as Laboratory, Pharmacy, and Radiology utilize separate automated information systems tailored for their unique requirements. Each system, however, is interfaced directly to the hospital information system in order to provide on-line access of the results of their patients tests and current medications to health care providers throughout the hospital and at the point of care.

Whenever activity occurs in the ancillary service areas, the workload, e.g., Complete Blood Count, Urinalysis, Chest X-ray, or prescription filled, is captured. In many hospitals the actual clinical equipment, e.g., Chemistry Analyzers, CT Scanner, or Baker Cells, is interfaced directly to the hospital information system. This is a significant advantage because of the extremely high volume of workload in the ancillary areas. A 200 to 300 bed hospital may have as many as 100,000 lab tests, 10,000 radiology

procedures, and 2000 pharmacy prescriptions completed each month. This high workload could not be easily managed without some degree of automation.

Cost capture for this ancillary workload is generally accomplished through interface with the hospital information system. Each test, procedure, and prescription is assigned an actual cost for the entire procedure. For lab tests, for example, this may include labor for equipment/test set-up time, and for nursing/technician time required to obtain the sample to be tested, and equipment depreciation, as well as the cost of the reagents/chemicals required to perform the test.

Billing for ancillary services is generally accomplished similar to consumable medical supplies. The billed amount is typically derived through mark-up formulas, based on the actual cost of the item, the current market rate, or rate allowed by third party payors. Ancillary service areas typically send "fee tickets" listing procedures completed to finance for entry into the billing system.

(3) Operating Room. Surgical procedures conducted in the operating room consume a large volume of medical supplies utilized in the hospital. Cost capture is generally most efficiently done through the materials management information system. The use of a "case cart system" seems to be the prevailing methodology to accomplish actual cost capture. Most hospitals have "physician preference cards". These preference cards list all the items required by the physician to complete a specific surgical procedure. It lists all the consumable supplies, and the quantities required for each item. It also specifies the physicians "preference" concerning the manufacturer/brand of the items required. The list typically includes items such as the surgical gloves, sutures, bandages, prostheses, implants, as well as any specialized equipment that may be required,

e.g., fiber optic scopes, drills, screwdrivers. Preference cards are developed and maintained for each procedure that each surgeon may perform. Thus if several different surgeons are credentialed to perform the same procedure, there will be several different preference cards maintained, each specifying the surgeons different supply and equipment preferences. A sample physicians preference card is shown as Figure 4. (Ref. Stewart, 1994)

Many hospitals use "case carts" to ease the burden of clinical personnel in ordering and cost capture of surgical supplies. Each preference card is simply "bundled" into one case cart, which delineates each item and quantity as specified on the preference card. When a surgical procedure is scheduled, operating room personnel can simply order the case cart required, rather than the entire list of required items. This case cart feature can save clinical operating room personnel many man-hours of administrative workload in preparation for surgery. When the surgical procedure is completed, unused case cart items may be credited and returned to storage. (Ref. Church, 1994)

Cost capture for operating room workload is generally accomplished through actual costing of each item utilized during the procedure, based on case cart usage. In addition to consumable supply costs, cost capture typically includes labor for physician, nursing, and technician time, required to complete the surgical procedure, and equipment usage/depreciation charges. (Ref. Church, 1994)

Billing is generally accomplished on a per procedure basis. The billed amount is typically derived through mark-up formulas, based on the actual cost of the items used, the current market rate, or rate allowed by third party payors. The operating room typically sends "fee

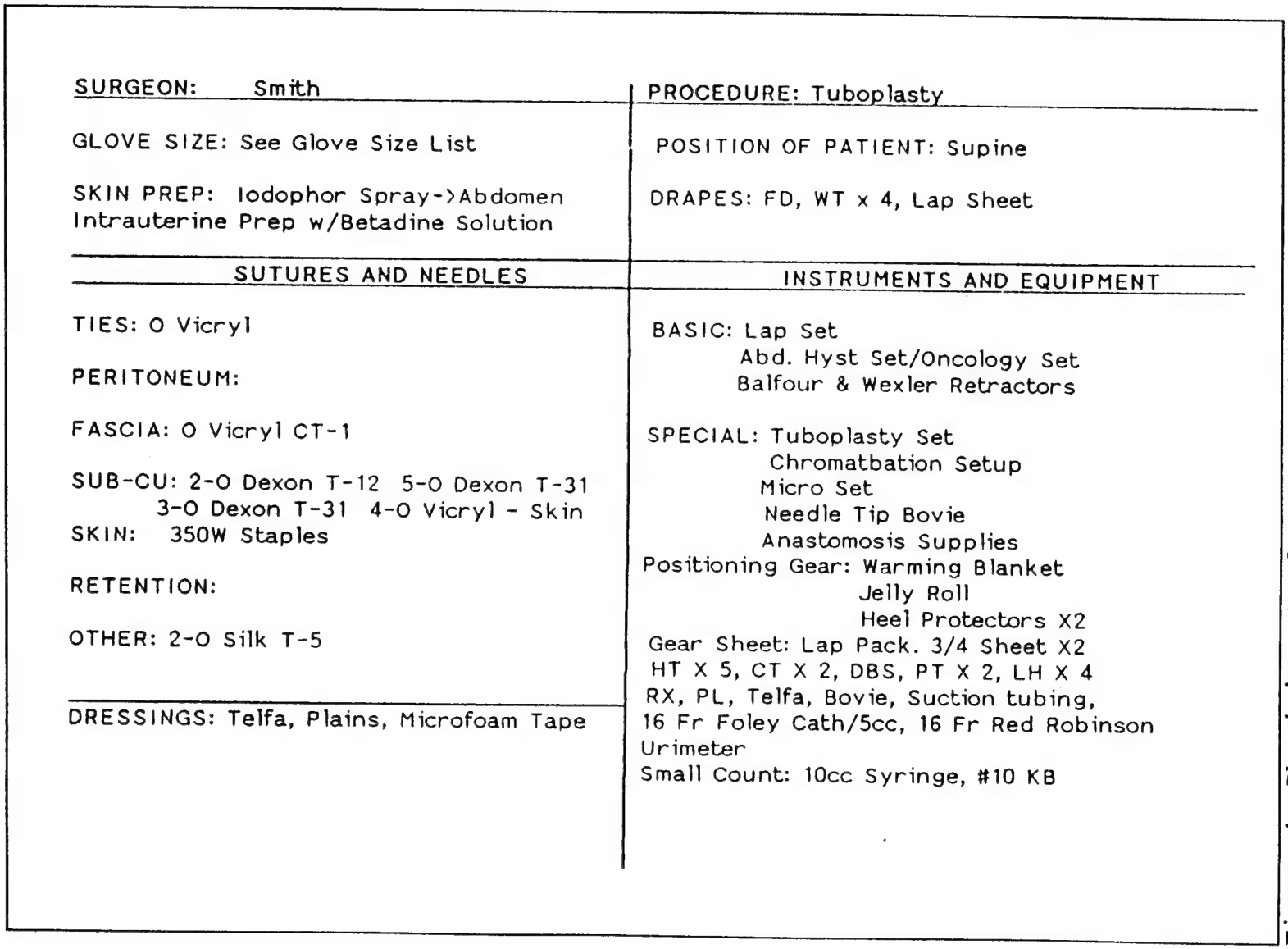

Figure 4. Physicians Preference Card (Ref: Stewart, 1994)

tickets" listing procedures completed to the finance department for entry into the billing system. (Ref. Church, 1994)

C. MATERIALS MANAGEMENT INFORMATION SYSTEM

Materials Management Information Systems (MMIS) currently in use in civilian hospitals fully integrate the major functional areas of material management. These major areas include inventory management, procurement, material receipt, and physical distribution.

1. Inventory Management

Inventory is managed at all levels throughout the hospital. Inventory levels include the main warehouse, central supply, and customer storage areas. The MMIS gives the material manager visibility of all assets in all inventory levels. Stock levels for each level of inventory are calculated by the MMIS based on demand for each item. Intravenous fluids for example may be stocked by the case in relatively large quantities, i.e., weeks, in the warehouse, in lesser quantities, i.e., days, by the unit of measure in central supply, and in the patient care areas in quantities required for only 24 hours. The MMIS is typically bar-code capable. All transfers of material from warehouse to central supply and to each patient care unit is accomplished automatically since all the different functional areas are fully integrated. When the daily cycle is run, for example, stock replenishment orders are automatically generated for central supply and for the main warehouse. The MMIS will generate a pick list for material to be issued from the main warehouse to central supply based on current on-hand inventory levels. Inventory quantities are automatically updated for both central supply and the main warehouse during the daily cycle, i.e., the main warehouse inventory is decreased and the central supply inventory is increased. The MMIS automatically

calculates the appropriate quantity to issue notwithstanding the possible difference in unit of issue/unit of measure.

Clinical unit PAR levels are also managed by the MMIS. Items stocked on the PAR level may be obtained from any source of supply, not just central supply, this may include warehouse stock or stock that must be directly procured from commercial vendors. Appropriate stock levels are calculated for each item regardless of the source of supply.

2. Procurement

Orders from all levels of inventory may be sent automatically to procurement for acquisition from commercial sources. When inventory quantities drop below specified order points the MMIS sends a replenishment order to procurement. The purchasing agent simply reviews the order for accuracy, pricing, and delivery date, and either prints a purchase order for mailing to the company, or electronically transmits the order to the vendor if authorized. If the order is electronically transmitted, order confirmation, stock status, and expected delivery date will be received in a few minutes. The completed purchase order is then flagged as "due-in" until physically received at the hospital's loading dock.

3. Physical Receipt

Materials management receiving personnel "receive" the order in the MMIS after ensuring the items physically received conform to the purchase order. When the order is received in the MMIS, the appropriate inventory is updated. This inventory may be the main warehouse, central supply, PAR level, or individual department, and is determined by the department code/cost code entered on the order. Following completion of receipt in the MMIS, physical distribution to the appropriate storage location is accomplished.

4. Physical Distribution

Physical distribution of material throughout the hospital may generally be accomplished through several different methods, depending on the level of support desired by the customer. Most MMIS support distribution of material by PAR level, case cart, or individual orders.

PAR level restocking entails the automatic replenishment of clinical customer areas by materials management personnel. Clinical areas with the help of materials management determine the high demand items for their area. In addition essential non-demand based, and low demand items may also be identified for PAR stock. Each item on PAR is then stocked based on actual demand for high use items, or the required quantity for essential, and low demand items.

Materials management personnel generally replenish each PAR stock area every 24 hours. This requires the physical inventory of each item stocked. Typically, this is accomplished by physically counting any remaining stock, and entering the quantity into a hand-held portable scanner after the item's bar-code sticker is scanned. Upon down-load to the MMIS, a pick-list will be generated based on the difference between the required quantity and the actual on-hand quantity. The inventory level of each item is automatically updated for both the PAR level and central supply. Once the stock is picked from the appropriate storage area it is physically transported to the clinical unit and the PAR stock is replenished.

Most MMIS also have case cart capability for the operating room. As previously described, the case cart consists of a "bundled" order for a specific physician and specific procedure. Each preference card can be programmed as a case cart, which delineates each item and quantity as specified on the preference card. When a surgical procedure is scheduled, operating room personnel can simply order the

case cart required, rather than the entire list of required items. The MMIS will generate a pick list for materials management personnel to issue all items within their storage areas. The system may also generate a separate pick list for items stored in the operating room suites, and items that may require direct procurement from commercial vendors. When the procedure is completed, unused items may be credited and returned to storage.

D. COST ANALYSIS

With the availability of actual, itemized cost data delineated by diagnosis-related group and by physician, detailed analysis can be conducted. Physician practice pattern variance analysis can be conducted. Studies by the American Hospital Association have shown that there is a considerable amount of variance between providers, which if reduced can save valuable resources.

The availability of this actual cost data will enhance make-or-buy decision making ability. Based on the cost analysis, hospitals are better able to make patient-care sourcing decisions. For example, if the total cost for a cardiothoracic surgical procedure costs $7000 to perform in-house, and $5000 to buy the service at another facility, the appropriate decision may be to refer the patient outside the facility. In addition, profit analysis might also be conducted. The same procedure may only result in a reimbursement from a third-party payor of $6000. A strategic decision may then be made to discontinue unprofitable services, and expand profitable services in order to optimize facility capacity. A sample of a detailed cost summary for cardiothoracic surgery is provided as Figure 5 as an example of the cost data required for patient care sourcing cost analysis.

MAIN OPERATING ROOM
CONSUMABLE SUPPLY SUMMARY

CARDIOTHORACIC SURGERY

ITEM	UNIT COST	QTY	TOTAL COST	ITEM	UNIT COST	QTY	TOTAL COST
3cc SYRINGE	$0.03	1	$0.03	5-0 PROLENE RB-2	$3.20	2	$6.40
10cc SYRINGE	$0.06	1	$0.06	SUCTION LINER	$3.22	2	$6.44
#20 KNIFE BLADE	$0.08	1	$0.08	STOCKINETTE	$3.27	2	$6.54
27 GA NEEDLE	$0.09	1	$0.09	BULLDOG, BLACK	$7.00	1	$7.00
18 GA NEEDLE	$0.03	4	$0.12	BULLDOG, GRAY	$7.00	1	$7.00
BENZOIN SWABS	$0.18	2	$0.36	NEEDLE, IMA	$8.10	1	$8.10
4X8 PLAIN GAUZE	$0.22	2	$0.44	SARN SAW BLADE W/SCREW	$11.34	1	$11.34
60cc SYRINGE	$0.23	2	$0.46	2-0 POLYDEX	$3.00	3	$9.00
BETADINE OINTMENT	$0.55	1	$0.55	3/4 SHEET	$3.05	3	$9.15
CLIPPER HEADS	$0.19	4	$0.76	SURGICAL GLOVES	$0.82	12	$9.84
1" SILK TAPE	$0.44	2	$0.88	2-0 SURGILON	$2.00	5	$10.00
FOLEY CATHETER	$0.94	1	$0.94	LAP TAPES	$1.88	6	$11.28
PREP PAD	$1.00	1	$1.00	FOGARTY INSERTS	$9.40	2	$18.80
KERLIX	$0.55	2	$1.10	#5 CHEST WIRE	$10.00	2	$20.00
BEAVER BLADES	$4.70	2	$9.40	UMBILICAL TAPE	$11.00	2	$22.00
ELASTIKON TAPE	$1.50	1	$1.50	SURGICAL GOWN	$2.78	8	$22.24
STRAIGHT CONNECTORS	$6.70	1	$6.70	PAUNG CABLES	$7.00	4	$28.00
CATHETER KIT	$1.77	1	$1.77	VASCULAR PUNCH	$33.00	1	$33.00
36 FR CHEST TUBE	$9.73	1	$9.73	8-0 PROLENE	$17.00	2	$34.00
3-WAY CONNECTOR	$3.00	1	$3.00	SUTURE VEIN PACK	$73.25	1	$73.25
IRRIGATION-NaCl	$0.99	4	$3.96	OPENING & CLOSING PACK	$19.51	1	$19.51
OPERAND TVP IODINE GEL	$1.03	4	$4.12	MEDIASTINAL DRAIN	$43.17	1	$43.17
5-0 PROLENE RB-1	$2.00	2	$4.00	DRAPE PACK	$70.43	1	$70.43
2-0 SILK	$2.00	2	$4.00	BEEF LUNG HEPARIN 1000u	$80.00	2	$160.00
RAYTEX	$1.01	4	$4.04	OPEN HEART PUMP PACK	$157.33	1	$157.33
TUBING ORGANIZER	$4.50	1	$4.50	AORTIC PUNCH	$3.20	1	$3.20
PAPAVERINE 30mg/ML IV	$2.51	2	$5.02	DACRON TAPE	$11.20	1	$11.20
BACITRACIN 50,000u	$2.55	2	$5.10	OLIVE TIP NEEDLE	$9.50	1	$9.50
IRRIGATION-L. R.	$0.99	6	$5.94	NEUTRALON GLOVES	$5.08	4	$20.32
#1 PDS	$3.00	2	$6.00	COTTON CARDIAC RETRACTI	$14.00	2	$28.00
URIMETER	$6.10	1	$6.10	AORTIC VALVE	$4,900.00	1	$4,900.00
							========
				GRAND TOTAL SUPPLY COST			$5,367.79

Figure 5. Cardiothoracic Surgery Cost Summary (Ref. Stewart, 1994)

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

A number of studies agree that approximately 43% of a typical hospital's budget is spent on logistics related expenditures such as supplies, equipment, and distribution. 19% accounts for the products themselves, and 24% for the internal management and administrative overhead. (Ref. Walters, 1994)

Of the $9.9 billion (Operations & Maintenance) appropriation for direct health care in the Fiscal Year 1995 Defense Health Plan, consumable supplies thus account for as much as $1.81 billion, and logistics related overhead accounts for as much as $2.32 billion. Variance reduction programs such as physician practice pattern programs have proven to be very effective. One hospital reports a reduction in supply costs of 30% for selected DRGs (Ref. Keill, 1994). On a Military Health Services System wide basis this would equate to a potential savings of up to $270 million annually for inpatient care, assuming 50% of the supplies are utilized for inpatient treatment.

Evidence of variance in physician practice patterns is well documented:

> In Vermont, the chance of having one's tonsils removed as a child range from eight percent in one community to 70 percent in another. In Iowa, the chance a man will undergo prostate surgery by age 85 varies from 15 percent to more than 60 percent. A comparison of utilization rates across four states found more than threefold differences in rates of heart bypass, thyroid, and prostate surgeries; fivefold differences for back and abdominal surgeries; sevenfold differences for knee replacements; and almost 20-fold differences for carotid endarterectomies (Ref. Eddy, 1992).

As health care costs continue to rise the Department of Defense has begun to implement managed health care reform initiatives such as capitation based resource allocation, and implementation of fixed-price Managed Care Support contracts. For DoD to provide the most cost effective care in this new environment, however, hospital commanders must have available detailed accurate cost data. Current systems are not adequate, and do not communicate actual costs to administration, management, or the medical staff. Without this actual cost data, physicians cannot evaluate the cost effectiveness of their care and variance reductions programs cannot be effectively implemented. In addition hospital commanders, now responsible for all health care costs within their facilities catchment area under the newly implemented capitated budget, cannot effectively make decisions to provide care at the most cost effective source, be it within the military facility or in the civilian sector via the Managed Care Support contract.

B. CONCLUSIONS

1. DoD lacks the type of cost accounting system needed to support variance reduction programs and effective health care sourcing decisions. Cost-center accounting currently being practiced in DoD provides little more than aggregate expense information, gathered at periodic intervals, on which to base decisions. This aggregate cost information is not sufficient to support variance reduction programs. Currently, expense data is not captured by physician, nor by diagnosis-related group, thus does not produce a clear picture of an individual physician's practice pattern.

For hospital commanders and lead agents to make the most cost effective health care delivery sourcing decisions, marginal cost or variable cost data delineated by DRG must be utilized. Average costs, available through the Medical

Expense and Performance Reporting System (MEPRS), are not sufficient to conduct "make or buy" decisions. Although hospital commanders may know the actual cost of treating an episode of care for a particular DRG under the fixed-price Managed Care Support contract, they do not know how much it costs to treat that same episode of care in-house. Lead agents are not able to compare the actual cost of treating episodes of care for particular DRG's for facilities within their health service region. Thus if excess capability exists within a region, lead agents cannot facilitate strategic decisions to reduce duplication of services, and excess capacity, within the region based on cost effectiveness.

2. The Navy Medical Department lacks effective logistics automated information systems which leads to inefficient logistics business practices. The current logistics automated information systems, MICS, CPD, and APS, and the ever growing number of Prime Vendor systems, are not integrated, and thus are significantly labor intensive for both the customer and for materials management personnel. Clinical personnel spend valuable time and money ordering, receiving, and stocking medical supplies in their areas, and maintaining unofficial inventories to ensure availability of required medical material. Transfer of materials and their associated costs between information systems requires manual input of data.

Costs are captured by department, or work-center, in support of the cost-center type accounting system currently in use, with no way to tie actual costs to each individual patient, episode of care, or procedure.

C. RECOMMENDATIONS

1. DoD should pursue a product-line type accounting system which supports cost capture by DRG. Average and aggregate costs as produced through the current systems are not sufficient as an input to variance reduction programs, and

for "make or buy" decision analysis. Only accurate cost data, captured by DRG will allow DoD to run effective physician practice pattern programs, reduce variation and costs. In addition, lead agents and hospital commanders require actual cost data captured by DRG in order to 1) provide health care at the most cost effective source whether it is provided in a military treatment facility or referred for treatment to the civilian sector, or 2) eliminate duplication of services within a health service region if excess capacity exists, or 3) optimize military treatment facility capacity if it is more cost-effective to provide in-house.

DoD, through the Joint Medical Logistics Functional Development Center, Frederick, Maryland, is currently developing a prototype Operating Target (OPTAR) Financial Management Information System (FMIS), with implementation and testing to be conducted at the National Naval Medical Center, Bethesda, Maryland. FMIS will enhance current capability to manage work-center/cost-center OPTARS and shall streamline and automate financial transactions and reports. It is obvious from the specification/statement of work that the prototype OPTAR FMIS continues to focus on cost-center accounting rather than product line accounting. This is further emphasized by its expected capabilities to:

- provide general ledger representation of all procurement records by account,
- provide virtual document transfer over networks,
- provide on-line management oversight of budget obligations and expenditures, and
- provide interface with Defense Finance Accounting Service automated systems (Ref. FMIS, 1994).

The FMIS should be enhanced to include the capability to segregate actual costs by patient, provider, and diagnosis.

2. The Navy Medical Department should pursue an integrated Materials Management Automated Information System which is capable of supply cost capture by patient, provider, and diagnosis, and capable of interfacing with the Hospital Information System. DoD is currently developing a tri-service material management information system referred to as the Defense Medical Logistics Standard Support (DMLSS) Automated Information System (AIS). DMLSS is planned to replace DoD's CPD system and seven large service-unique medical logistics AIS. The development of DMLSS was approved in March 1994 for implementation in three increments. The first increment, for which development efforts started in June 1994, is to replace CPD and the Navy's Micro-MICS system, a PC-based version of MICS for smaller non-stock funded medical treatment facilities. Increment 1 is divided into two projects, Customer Area Inventory Management (CAIM), and Stock Room Inventory Management (SRIM). The scope of CAIM includes:

- assisting the customer in identifying supply items required for patient care,
- providing automated support for requesting material items, and
- providing for the physical inventory, ordering, storage, transferring, receipt, and tracking of material in clinical areas (Ref. Joint Medical Logistics Functional Development Center, 1994).

SRIM provides automated support to maintain an Operations & Maintenance (O&M) funded perpetual inventory stock room to supply customer areas. SRIM will allow material management warehouses to be designated as sources of supply for products that require break-down from the unit of purchase, or unit of issue, to units of measure/use. It will provide the capability to create and update the master catalog of items, which forms the basis for individual customer area catalogs. Figures 6 and 7 show the areas covered by CAIM and SRIM.

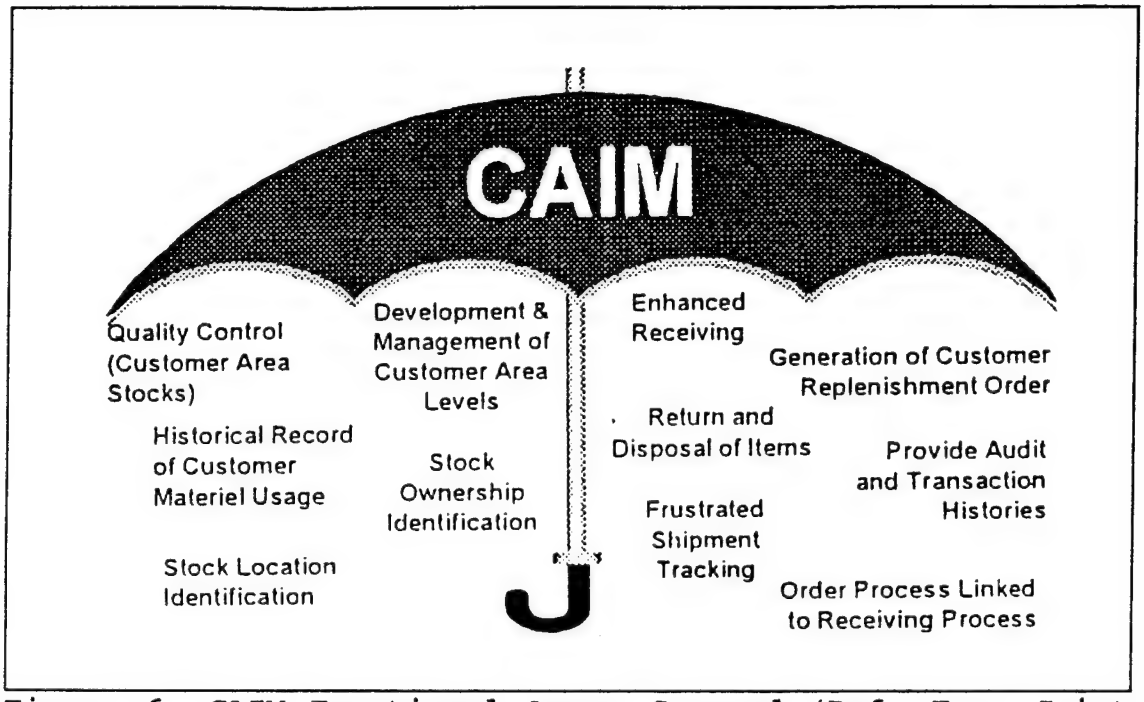

Figure 6. CAIM Functional Areas Covered (Ref. From Joint Medical Logistics Functional Development Center, 1994)

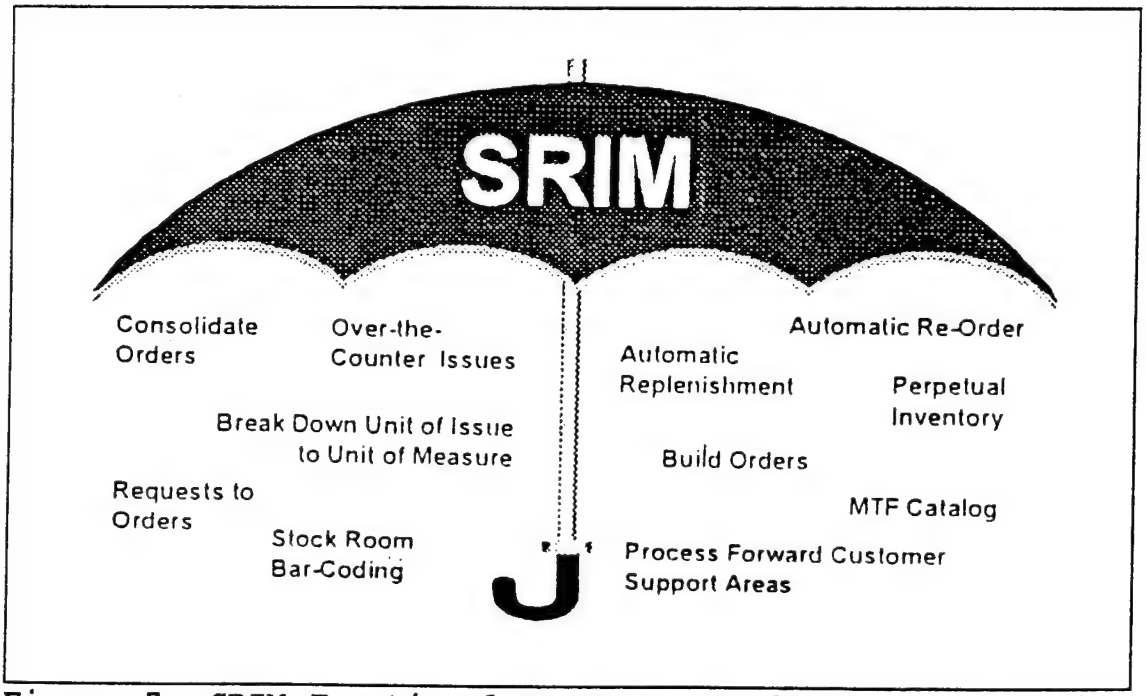

Figure 7. SRIM Functional Areas Covered (Ref: From Joint Medical Logistics Functional Development Center, 1994)

The development of DMLSS Increment 1 is scheduled for testing in January 1996 with implementation and testing at the Alpha-site scheduled for February 1996. Enhanced capabilities for Increment 1 include the ability to:

- interface for orders from customer areas,
- establish visibility of customer inventories,
- capture customer area demand history,
- interface with Prime Vendor systems,
- generate barcode labels for customer area locations,
- inventory customer areas using hand-held bar code scanners,
- identify items to be stocked in customer areas,
- establish stockage levels in customer areas,
- establish inventory schedules,
- utilize flexible inventory methods,
- build orders for muiltiple sources of supply,
- transfer items from customer area,
- return items from customer area,
- process receipts on exception basis,
- generate Ad-Hoc reports,
- track frustrated shipments,
- generate bar code labels for storeroom locations, and
- link order process to receiving process. (Ref. Joint Medical Logistics Functional Development Center, 1994)

Increments 2, and 3 shall replace the Navy's MICS, and APS respectively (Ref. Walters, 1994).

The DMLSS is not currently planned to have the capability for capturing consumable supply costs by patient, provider, and DRG. All supply cost capture will stop at the work-center/cost-center level (Ref. Abeya, 1994).

Although the DMLSS effort is a significant improvement over the current logistics information systems in use in the Navy Medical Department in terms of functionality, customer support, and integration of the principal functional areas of hospital materials management, the ability to capture actual supply costs by patient, provider, and DRG is essential in the current managed care environment. The Bureau of Medicine and Surgery must strongly recommend to the Assistant Secretary of Defense for Health Affairs expansion of DMLSS Concept of Operations to provide this enhanced capability.

DoD is continuing development and implementation of the Composite Health Care System (CHCS). CHCS is an automated, hospital information system composed of integrated modules that activated either together or independently, serve to support high volume workload areas, and greatly enhance communications between the supported areas. Integrated modules consist of patient administration, patient appointment scheduling, radiology, pharmacy, laboratory, dietetics, nursing, outpatient clinical services, and inpatient clinical services. CHCS connects and integrates all departments, administration, patient care areas, outlying clinics, and ancillary workcenters. Specifically, CHCS:

- supports administration, patient care, and ancillary workcenters;
- directs physician orders to all concerned clinical and administrative workcenters;
- collects data from all workcenters;
- provides results of all patient activities to health care professionals quickly and accurately; and

- provides authorized users immediate access to shared data (Ref. Science Applications International Corporation, 1994)

CHCS currently captures all workload in the high volume ancillary areas, i.e., laboratory, radiology, and pharmacy, by patient and provider. In addition the patient administration module includes the capability to assign DRG's to the patient upon discharge. The tests however, do not have costs attached, nor does CHCS currently have the capability for assignment of costs (Ref. Gladding, 1994).

The Navy Medical Department must pursue a software interface between CHCS and DMLSS. The actual costs of these tests can then be assigned in DMLSS and included with the consumable supply costs captured, thus providing another significant piece of the total costs associated with treatment of a specific episode of care.

D. AREAS FOR FUTURE RESEARCH

There are several other cost contributing areas that require additional research to complete the total patient care cost picture. The actual total cost of treating an episode of care includes these additional costs:

1. allocation of durable equipment depreciation charges to specific episodes of care based on equipment usage;
2. allocation of labor; and
3. allocation of direct overhead.

Lead agents and hospital commanders could then compare the total cost to treat an episode of care in-house with the total cost of treatment in civilian facilities under managed care support contracts in order to make cost effective patient care sourcing decisions. These decisions would facilitate optimization of the entire military health services system.

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7.	Defense Logistics Studies Information Exchange U. S. Army Logistics Management College Fort Lee, VA 23801-6043	1